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MULTIPART MILL HOUSING FOR EDGING STANDS IN ROLLING MILLS

The invention concerns a multipart mill housing for edging stands in rolling mills, which consists of main components, such as crossheads and longitudinal beams, which are joined by bolts.

Mill housings for edging stands are usually cast constructions for holding the assemblies necessary for the edging process, such as assemblies for adjusting, assemblies for balancing, sets of edging rolls, gearing, motor, and the like.

Two-part cast constructions are known, in which the mill housing has a horizontal line of separation, and the two halves are joined with positive locking, e.g., by means of a shrink ring.

All cast variants have the disadvantage that large cast parts must be produced with a correspondingly great degree of difficulty and corresponding casting risk. Another disadvantage is that due to the high part weights, increased requirements must be placed on the production machines to be used. Accordingly, the choice of foundries and machining works is

restricted, and this additionally results in commercial restrictions.

The type referred to at the beginning, which has also been realized in practice, is a multipart mill housing that has two crossheads and four longitudinal beams, which are joined by bolts.

The objective of the invention is to improve multipart edging stands in such a way that greater consideration is given to the area reduction of the housing window, the operating load, and the impact force (horizontal maximum force, under which the rolling stock is guided against the closed rolls of a vertical stand).

In accordance with the invention, this objective is achieved in a multipart embodiment of the main components, which consists of the two crossheads and the four longitudinal beams, by providing a common joint with a cruciform structure for the crosshead and the longitudinal beam at each of the upper and lower ends of the longitudinal beams, wherein prestressed through-bolts that act as joints are used at least at the upper ends of the longitudinal beams. These prestressed through-bolts guarantee a permanently secure connection by virtue of high prestressing. In this way, on the one hand, the bolt additional

force remains low relative to the prestressing force, and, on the other hand, the pulling apart or expansion of lines of separation is avoided. The joint-like connection by prestressing also results in less area reduction of the housing window under load compared to a comparable edging stand with only two parts.

In addition, due to the special cruciform structure at the ends of the longitudinal beams, the stress level and the diffusion of stress in the longitudinal beams and/or the crosshead are optimized. These statements have been borne out by models based on the finite-element method. In addition, it is possible to find an optimum for the bolt prestressing, with which the design-related hole in the crosshead for holding the adjusting device for the tool is not significantly deformed in conformity with narrow predetermined tolerances.

In accordance with a refinement of the invention, each crosshead is realized as a single piece and can be mounted on a bottom plate.

It is also advantageous for the crossheads to form an assembly by positive locking with the longitudinal beams and with the prestressed through-bolts.

In addition, the production of the mill housing is favorably affected if at least the crossheads and the longitudinal beams are made of cast materials.

Furthermore, the statics of the system are improved if the through-bolts are arranged in pairs symmetrically to the center plane.

Further improvement is achieved if, in addition to the through-bolts, screw bolts are arranged in pairs symmetrically with respect to the center plane.

In accordance with another refinement of the invention, the longitudinal beams are mounted in each crosshead by the cruciform structure, the through-bolts, and the screw bolts. The screw bolts can be screwed into threaded blind holes in the crosshead and can be arranged towards the outside of the mill housing.

The connections between the crosshead and longitudinal beams are preferably designed in such a way that the crosshead is provided with a cruciform pocket, which is engaged by an inner key form and an outer key form. The projections of the cruciform legs of the longitudinal beams contain holes for receiving the through-bolts and/or the screw bolts. The dimensions of the key forms depend on the design necessities of

the crosshead, and the size of the key forms is designed to allow the prestressed through-bolts to be passed through two longitudinal beams past the components installed in the crosshead.

The outer cruciform leg or the inner cruciform leg each forms a slot form or a key form, which fit into each other when they lie opposite each other. This slot form and the key form are inserted into the matching cruciform pocket of the crosshead. The cruciform pocket of the crosshead has a corresponding slot form and key form, and this results in a positive-locking connection between the crosshead and longitudinal beams.

The cross-sectional contour of the longitudinal beam transverse to the cruciform legs in slot form or key form or to the pocket in the crosshead depends on the actual loads of the edging stand with respect to the operating force and the impact force and is variably dimensioned over the length of the longitudinal beam. The cross section essentially follows the shape of a beam of the same load.

In accordance with other features, the cross-sectional transitions in the crosshead and/or in the longitudinal beams are provided with radii of suitably matched size according to

the operating force and impact force. This ensures uniform diffusion of stress.

The cruciform pockets of the crosshead and the cruciform key forms of each end of a longitudinal beam are provided with chamfers. The chamfers can be filled in with sealants, e.g., silicone. This prevents the penetration of dirt, water, and other foreign substances.

In accordance with another refinement of the invention, not only the through-bolts but also the screw bolts are designed as necked-down bolts and, like the through-bolts, have a heating hole, threaded ends and centering shoulders to facilitate assembly. All of the through-bolts and screw bolts are provided with a relatively long threaded end, which allows tractive controlled tightening with suitable prestressing tools, so that reliable control of the prestressing force is ensured.

The design described above can be modified by separating the crosshead into a crosshead upper part and a crosshead lower part and joining the upper part and lower part by means of a shrink ring, a flange joint or a connector.

Specific embodiments of the invention are illustrated in the drawings and are explained in greater detail below.

-- Figure 1 shows a front elevation of the mill housing.

-- Figure 2 shows a perspective view of the crosshead.

-- Figure 3 shows a perspective view of an individual longitudinal beam.

-- Figure 4 shows a section B-B in the upper part in a front plane and a section C-C in the lower part in a rear plane.

-- Figure 5A shows a view of the cruciform structure in the crosshead.

-- Figure 5B shows a side view corresponding to Figure 5A.

-- Figure 6 shows a partial section through the end of a longitudinal beam.

-- Figure 7 shows a top view of the cruciform structure in the longitudinal beam in direction "A" (Figure 6).

-- Figure 8 shows a view of a through-bolt.

-- Figure 9 shows a view of a screw bolt.

In accordance with Figure 1, the main components 1 consist of two crossheads 1a and 1b and four longitudinal beams 4a and 4b. Joints 3 with covering parts 3a are formed at each transition to a crosshead 1a, 1b.

In the 6-part embodiment illustrated here, in which the main components 1 consist of two crossheads 1a, 1b and four longitudinal beams 4a, 4b, a cruciform structure 7 that consists

of cruciform legs 11 or key forms 19 is formed at each end 6 of a longitudinal beam.

The joint between the crosshead 1a, 1b and the longitudinal beams 4a, 4b, each of which is supported on a bottom plate (not shown) below a crosshead base 8, is produced by through-bolts 5, which are prestressed and thus form a transverse joint that can expand in the material in the axial direction. The end 6 of the longitudinal beam is connected via the cruciform structure 7 with the crossheads 1a, 1b by means of screw bolts 10.

Tools, such as pairs of edging rolls or press blocks and the like, can be installed in the center plane 9.

A mill housing of this type is used for lateral edging, i.e., for reducing the width, of steel slabs with thicknesses of 150-300 mm at an input temperature of about 1,150°C or higher and at rates of 1.5-6 m/s or aluminum slabs up to 600 mm in thickness at an input temperature of about 540°C or higher.

The following features are clearly shown in the crosshead 1a, 1b in Figure 2: a cruciform pocket 12, cross-sectional transitions 2a, and an inner slot form 13a and outer slot form 13b.

Another main component 1 is the longitudinal beam 1a, 1b illustrated in Figure 3. The ends 6 of the longitudinal beam 4a

has key forms 19 arranged in the cruciform structure 7 with outer cruciform legs 13, inner slot forms 13a, outer slot forms 13b, and cruciform legs 11, which are provided with cross-sectional transitions 2b and holes 18 in the longitudinal beam 4a, 4b.

The crossheads 1a, 1b are mounted on the bottom plate below the crosshead base 8, and the joints 3 are produced as follows with the cruciform structure 7 in accordance with Figures 4, 5A and 5B:

The through-bolts 5 (Figure 4, upper part) join each crosshead 1a, 1b with the longitudinal beams 4a and 4b.

The screw bolts 10 (Figure 4, lower part) join each crosshead 1a, 1b with the longitudinal beams 4a, 4b and are each screwed into a threaded blind hole of the crosshead 1a, 1b.

The crosshead 1a, 1b (Figures 5A and 5B) forms an assembly by positive locking with the longitudinal beams 4a, 4b together with the through-bolts 5 and the screw bolts 10. The through-bolts 5 and the screw bolts 10 are arranged in pairs symmetrically to the center plane 9.

The crosshead 1a, 1b is provided with a pocket 12 and an outer cruciform leg 11, which form the cruciform structure 7 and interact with inner key forms 19a, outer key forms 19b of the

longitudinal beam 4a, 4b (or pockets 12 of the crosshead 1a, 1b) and form the positive-locking connection. The cruciform inner (or outer) key form 19a and an outer (or inner) key form 19b are arranged for this purpose.

Cruciform pockets 12 can also be provided only in the crosshead 1a, 1b. These cruciform pockets 12 are engaged by cruciform key forms 19a, 19b of the longitudinal beams 4a, 4b.

Chamfers 14 are chamfered or beveled on the cruciform pockets 12 with cruciform legs 11, which have adjoining slot forms 11a (Figure 5B) or key forms 19a, 19b. The chamfers 14 can be filled in with sealants, e.g., silicone, to prevent the penetration of dirt and/or water or other foreign substances.

The screw bolts 10 can be designed as necked-down bolts that same as the through-bolts 5 (Figures 8 and 9) and have heating holes 15, two threaded ends 16 and a centering shoulder 17 and pass through the holes 18.

Alternatively, the crosshead 1a, 1b is separated into a crosshead upper part 1c and a crosshead lower part 1d (Figure 4), and the upper part 1c and lower part 1d are joined by means of a shrink ring, a flange joint or a connector (not shown).

List of Reference Numbers

1	main component
1a	crosshead
1b	crosshead
1c	crosshead upper part
1d	crosshead lower part
2a	cross-sectional transition in the crosshead
2b	cross-sectional transition in the longitudinal beam
3	joint
3a	covering parts
4a	longitudinal beam
4b	longitudinal beam
5	prestressed through-bolt
6	end of a longitudinal beam
7	cruciform structure
8	crosshead base
9	center plane
10	screw bolt
11	cruciform leg

11a slot form

12 (cruciform) pocket in the crosshead

13 outer cruciform leg

13a inner slot form

13b outer slot form

14 chamfer

15 heating hole

16 threaded end

17 centering shoulder

18 hole

19 key form

19a inner key form

19b outer key form